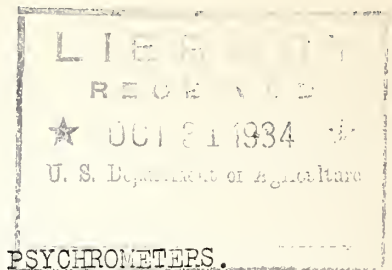


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U. S. Department of Agriculture
Weather Bureau
Instrument Division



SPECIFICATIONS FOR REPLACEMENT FOR TUBES FOR SLING PSYCHROMETERS.

1. Stems- The stems shall be of glass, about $31/64$ inch in diameter (between $12/64$ and $14/64$ inch).
 2. White strip- To facilitate readings a strip of white glass shall be provided running the full length of the stem back of the bore.
 3. Bulbs- Bulbs must be cylindrical in form, not more than $2/10$ inch in diameter nor longer than $7/8$ inch, of clear glass of a quality that does not change appreciably with age.
 4. Neck- In order to make provision for securely tying a muslin to the bulb, a neck of smaller diameter than the bulb below or the stem above must be formed just above the junction of stem with tube.
 5. Length- Length of stem and bulb combined shall be $9-1/4$ inches (between 9 and $9 1/2$ inches)
 6. Filling- The thermometer must be filled with pure mercury. The space not occupied by the mercury to be a vacuum.
 7. Terminal nib- As a provision for holding the tube in its proper relation to the back when subsequently mounted, a nib approximately $3/32$ inch thick will be formed at the upper end of the stem.
 8. Graduations- All lines, figures, and letters to be etched clean cut and distinct. Graduations shall be to whole degrees Fahrenheit. The first and each succeeding 5 and 10 degree line to be longer than the remaining lines. Graduations to be numbered at each multiple of 10 degrees, numbers below zero to be preceded by the minus sign. Figures shall be etched to the right of the bore, but in a vertical position when the stem is held horizontally with bulb to the left. The lowest line of graduations must be at least $1/2$ inch above the bulb.
- Each tube will bear near its upper end a serial number to be specified in the order, and the initials U.S.
- All etchings to be filled with best quality black pigment.
9. Range- The lower limits may range between minus 20° and minus 40° Fahr. The upper limits may range between plus 110° and plus 130° Fahrenheit.
 10. Scale error- The error at any point of the scale must be no greater than the following:

at 32° (ice point)	0.2 degree.
Above 32°	0.3 degree.
Between 32° and 12°	0.3 degree.
Below 12°	0.6 degree.

The change in the error for a distance of 10 degrees must be no greater than 0.3 degree on any part of the scale.

11. Openness of scale.- The distance between points 20° Fahr. apart need not be more than 1/16 inches, but must not be less than 7/8. inch.

12. Workmanship.- First class and thoroughly finished instruments are required. For example, stems must be straight and of uniform bore, and free from scratches. Lines must be clean cut and straight without ragged edges. Bulbs must be of uniform thickness and joined to the stem in a smooth and workmanlike manner.

13. Each instrument will be carefully inspected and tested before acceptance; but recognizing the difficulty attending the production of a large number of thermometers that come within the limits prescribed in these specifications it is stated that while the purchasing bureau or department will in its discretion strictly adhere to said specifications, yet it is not the intention to reject instruments inherently correct and of good workmanship, provided the greater part of the thermometers furnished come within the limits herein prescribed, and prove satisfactory throughout.

14. Prospective bidders will be required to furnish evidence of their ability to produce and deliver in the quantity required thermometers of the character indicated in the above specifications.

15. There must be no change in the ice point measureable by customary methods of testing during a period of 90 days. The right is reserved to delay payment for a period of 90 calendar days for the purpose of making repeat tests to determine shift of the ice point.

B. C. Kadel,
Chief of Division

Washington, D. C.,
October 15, 1934.

These specifications supersede specifications for psychrometer tubes dated October 22, 1930.



1. $\frac{1}{x^2} = x^{-2}$
 $\frac{d}{dx} x^{-2} = -2x^{-3} = -\frac{2}{x^3}$

2. $\frac{d}{dx} \ln(x) = \frac{1}{x}$

3. $\frac{d}{dx} \ln(x^2) = \frac{1}{x^2} \cdot 2x = \frac{2}{x}$

4. $\frac{d}{dx} \ln(x^3) = \frac{1}{x^3} \cdot 3x^2 = \frac{3}{x}$

5. $\frac{d}{dx} \ln(x^4) = \frac{1}{x^4} \cdot 4x^3 = \frac{4}{x}$

6. $\frac{d}{dx} \ln(x^5) = \frac{1}{x^5} \cdot 5x^4 = \frac{5}{x}$

7. $\frac{d}{dx} \ln(x^6) = \frac{1}{x^6} \cdot 6x^5 = \frac{6}{x}$

8. $\frac{d}{dx} \ln(x^7) = \frac{1}{x^7} \cdot 7x^6 = \frac{7}{x}$

9. $\frac{d}{dx} \ln(x^8) = \frac{1}{x^8} \cdot 8x^7 = \frac{8}{x}$

10. $\frac{d}{dx} \ln(x^9) = \frac{1}{x^9} \cdot 9x^8 = \frac{9}{x}$

11. $\frac{d}{dx} \ln(x^{10}) = \frac{1}{x^{10}} \cdot 10x^9 = \frac{10}{x}$

12. $\frac{d}{dx} \ln(x^{11}) = \frac{1}{x^{11}} \cdot 11x^{10} = \frac{11}{x}$

13. $\frac{d}{dx} \ln(x^{12}) = \frac{1}{x^{12}} \cdot 12x^{11} = \frac{12}{x}$

14. $\frac{d}{dx} \ln(x^{13}) = \frac{1}{x^{13}} \cdot 13x^{12} = \frac{13}{x}$

15. $\frac{d}{dx} \ln(x^{14}) = \frac{1}{x^{14}} \cdot 14x^{13} = \frac{14}{x}$